

**REPORT**

**Regional Consultation  
on Locust Management  
in Caucasus and Central Asia  
(CCA)**

Almaty, Kazakhstan

27-30 October 2009



Food  
and  
Agriculture  
Organization  
of  
the  
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Nations

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Participants to the “Regional Consultation  
on Locust Management in Caucasus and Central Asia (CCA)”  
Almaty, Kazakhstan, 27-30 October 2009

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## **LIST OF ACRONYMS AND ABBREVIATIONS**

a.i.	Active ingredient
CCA	Caucasus and Central Asia
CIT	<i>Calliptamus italicus</i> (Linnaeus 1758), Italian Locust
CLCPRO	FAO Commission for Controlling the Desert Locust in the Western Region
DMA	<i>Docioptaurus maroccanus</i> (Thunberg 1815), Moroccan Locust
EC	Emulsifiable Concentrate
EIT	Economic Injury Threshold
FAO	Food and Agriculture Organization of the United Nations
GIS	Geographical Information System
GPS	Global Positioning System
GTZ	<i>Deutsche Gesellschaft für Zusammenarbeit</i> (German Agency for Technical Cooperation)
IGR	Insect Growth Regulator
LMI	<i>Locusta migratoria</i> (Linnaeus 1758), Asian Migratory Locust
MoA	Ministry of Agriculture
OP	Organophosphate
PRG	Pesticide Referee Group (FAO)
PYR	Synthetic pyrethroid
SGR	<i>Schistocerca gregaria</i> (Forskål, 1775), the Desert Locust
TCP	Technical Cooperation Programme (FAO)
ULV	Ultra-Low Volume

## INTRODUCTION

1. The Regional Consultation on Locust Management in Caucasus and Central Asia (CCA) took place in Almaty, Kazakhstan, on 27-30 October 2009. It was organized in the framework on the FAO regional project TCP/INT/3202 (D) entitled “Improving management of migratory and other locusts in the Caucasus and Central Asia”.
2. The following countries participated in the Regional Consultation: Afghanistan, Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan and the Russian Federation, the latest attending as an observer. The List of Participants is given in Annex I.
3. The Regional Consultation started with an opening speech made by Ms Gulnara Yusupova, Chief Expert of the Committee of State Inspection in the Agroindustrial Complex of the Ministry of Agriculture. On behalf of the Ministry of Agriculture of Kazakhstan, Ms Yusupova welcomed all participants of the Regional Consultation on Locust Management in CCA and wished them a fruitful meeting. She said that locusts were always among the most dangerous agricultural pests in the two regions. An unprecedented outbreak in the end of the 20<sup>th</sup> century had raised the necessity to coordinate national efforts against locust pests, which do not observe borders. To that end, the participants of the FAO Round Table discussion in 2000 signed a letter to FAO Director General requesting to study the possibility of creating a Central Asian locust commission. The current FAO TCP/INT/3202(D) addresses again the issue of regional coordination of locust monitoring and control. She said the new internet-based information technologies and tools should be instrumental in coordinating locust monitoring and control across borders. Finally, she stated that the Ministry of Agriculture of Kazakhstan supports the regional approach which would contribute to improving locust management.
4. On behalf of FAO, Dr Annie Monard, Locust Officer, welcomed the delegates attending the Regional Consultation on Locust Management in CCA. She also expressed her gratitude to Kazakhstan, the hosting country. She reminded that the meeting reflected the willingness of all CCA countries to establish an efficient regional cooperation to better address their common locust issues. Then, she mentioned the missions carried out by the FAO three-member team in the countries that she thanked for their hospitality. The subsequent analysis of the data gathered resulted in an “Analytical Report on Locust Situations and Management in Caucasus and Central Asia (CCA)”, made available one month ago. She said that the purpose of the Regional Consultation was to discuss recommendations of this Analytical Report as well as to agree on ways and modalities to establish regional cooperation for better locust management and that a working paper had been prepared to that end (also sent to countries one month ago). Finally, she provided additional information on the agenda and practical information on the meeting.

## OFFICERS OF THE SESSION

5. The following officers were elected:

Chairperson	Ms Gulnara Yusupova (Kazakhstan)
Vice-Chairperson	Mr Ilham Bayramov (Azerbaijan)
Drafting Committee	Mr Vladimir Pak (Kyrgyzstan) Mr Furkat Gapparov (Uzbekistan) Ms Annie Monard, FAO Locust Officer Ms Marion Chiris, FAO Consultant, Locust Group Mr A. Latchininsky, FAO Consultant, Locust Expert

## AGENDA

6. The Agenda, as adopted, is given in Annex II.

### SESSION 1: NATIONAL LOCUST SITUATIONS IN 2008/2009

#### Presentation by countries

- Delegates of all present countries made comprehensive presentations on their national locust situations in 2009. A summary of each presentation is provided in Annex III.
- All delegates provided information on surveyed, infested and treated areas concerning all locusts and grasshoppers in 2009, as follows:

Country	Area (ha)		
	Surveyed	Infested	Treated
<b>Afghanistan</b>	200 000	170 000	140 000
<b>Armenia</b>	27 300	27 300	4 900
<b>Azerbaijan</b>	280 000	130 750	50 100
<b>Georgia</b>	120 000	30 000	11 827
<b>Kazakhstan</b>	10 321 400	2 983 400	1 945 800
<b>Kyrgyzstan</b>	194 313	149 519	126 912
<b>Tajikistan</b>	233 479	104 334	93 268
<b>Uzbekistan</b>	1 000 000	800 000	621 000
<b>Russian Federation</b>	11 481 620	3 235 670	460 810
<b>Total</b>	23 858 118	7 630 973	3 454 617

#### Discussion

- During the discussion which followed countries' presentations, the delegates mentioned cross-border locust movements, putting emphasis on this issue as one of the most important – and hard-to-address – in regional locust management. In this regard, many participants praised the timeliness and importance of the current Regional Consultation for improving locust management in Caucasus and Central Asia (CCA).

10. Part of the discussion also focused on locust biology under changing climate and ecological conditions. While the Moroccan Locust (DMA) is typically a fast-developing, early-spring species, in some cases the hopper development was recently extended –up to 60 days in Azerbaijan. On the other hand, the Italian Locust (CIT) is well-known for its very long hatching period which results in populations with mixed age structure (e.g., first to fourth instars). Delegates from Kazakhstan and the Russian Federation noted that this has become even more pronounced in the recent years, requiring re-treatment of the same areas (two or even three times). Sometimes, it was difficult to find egg-pods: they do not maintain their structure over the winter period, although the eggs remain viable (as in the Russian Federation in 2009). Several delegates underlined the necessity to study the new behaviors of DMA and CIT, which did not fit anymore with the previously established rules of developmental rates (Sum of Effective Temperatures, etc.). In Kyrgyzstan, locusts are controlled in agricultural areas (plains), but not sufficiently in foothills because of difficult access, lack of funds and technical means. These areas are in fact the sources of locust infestations all over the country (DMA in southern oblasts and CIT in northern ones). The need for updated information sources summarizing new developments and changes in locust biology and ecology in the recent years was also emphasized at various other occasions.
11. Several interventions concerned newly-emerging *Orthoptera* pests. In reply to the delegate of Uzbekistan, the Russian delegation indicated that the importance of *Tettigoniidae* (long-horned grasshoppers) was increasing, especially in Siberia and in North Caucasus. This recent upsurge was probably connected to climate change. The delegate from Kazakhstan also emphasized the importance of non-swarming grasshoppers in the recent years. This was particularly significant in fallows of different-aged vegetation (three, seven, ten years, etc.), which provide suitable conditions for different grasshopper species. While locusts are controlled by regular chemical treatments, grasshoppers, which are not often recognized as pests, are less treated.
12. The discussion also concerned pesticides. It was underlined that some countries use many different pesticides while others only a few. It was also mentioned that some pesticides, which are banned in some countries because of their negative impact on human health and the environment, seem to be still produced or registered in others. Delegates expressed the wish that coordination be reached at regional level; in particular, it would be necessary to harmonize registration procedures (which could include use of trial results obtained in other countries on effective and less harmful pesticides).
13. Upon request from the FAO Consultant, Locust Group, the delegates provided information on the status of locust pests at national level: locusts are recognized as especially dangerous pests in seven countries (out of the nine present ones), as follows: Afghanistan, Armenia, Azerbaijan, Georgia, Kazakhstan, Uzbekistan and Tajikistan. In Kyrgyzstan, the governmental decree for recognition of locusts as one of the especially dangerous pests is not adopted yet. The delegates of the Russian Federation informed that they had also the intention to update the existing list of especially dangerous pests and diseases for inclusion in the national legislation.
14. Last, the Russian delegation informed that their Ministry of Agriculture (MoA) conducted several thematic workshops every year; they invited the other countries to attend them in order to promote information and experience exchange.

## **SESSION 2: TOWARDS REGIONAL COOPERATION**

### **Analytical report on locust situations and management and recommendations**

#### Presentation

15. The FAO Locust Officer, Dr Annie Monard, presented a comprehensive and well-illustrated summary of the “Analytical Report on Locust Situations and Management in Caucasus and Central Asia (CCA)”, which was prepared on the basis of all data provided by the countries, in particular during three round-trip missions carried out in 2008 and early 2009. Starting with maps to remind the transboundary nature of the three main locust pests of the region (the Italian, Moroccan and Migratory Locusts), whose traditional habitats overlap national borders, her statement went successively through the eight parts of the analytical report concerning the institutional and technical framework, locust monitoring, locust control, human health and the environment, regional cooperation, external assistance and the way forwards. She highlighted for each of them the main features, constraints, countries’ expectations and recommendations. This analysis demonstrated that any long term solution could only come from improved national and regional locust management, and allowed defining the main strategic lines to effectively reach this objective.

#### Discussion

16. The discussion which followed the presentation of the Analytical Report started by the delegates praising its comprehensive character and stating that it reflected well the locust management in their respective countries. The delegate from Georgia said that the Report was a big work of the FAO team. Many delegates emphasized that they learned a lot about locust management in the neighboring countries from the Report.
17. The delegate from Afghanistan requested FAO advice on environmentally less hazardous pesticide (including bio-pesticide) used against locusts. The FAO Locust Officer replied that such advice in terms of recommended doses of active ingredients to be applied can be found in the Pesticide Referee Group (PRG) reports which were available online (the most recent one dated 2004). The delegate from Kazakhstan indicated that her country was using the FAO PRG recommendations on pesticide use against locusts on a regular basis. For example, Insect Growth Regulators (IGRs) have been used in Kazakhstan for more than ten years. In Uzbekistan, the IGRs are making their way into practice. The delegate from Kyrgyzstan suggested that harmonization in pesticide use was needed among the CCA countries. The delegate from Kazakhstan noted that harmonization is also needed in the three crucial areas such as legal, technological and methodological basis.
18. Many delegates reiterated their concern regarding the transboundary nature of the locust pests in the region, which was well reflected in the Analytical Report. Organization and implementation of cross-border surveys was the subject of discussion between the delegates from Afghanistan, Uzbekistan, and Georgia. This question would be addressed during discussions on ways and modalities for regional cooperation.
19. Finally, the delegate from Kazakhstan said that FAO should help with sensitization of national governments regarding locust issues. She offered the example of Kazakhstan

where locust management was taken seriously, especially since the CIT outbreak of 1999-2000; during emergencies, the campaign headquarters are headed by the Prime Minister. However, such approach is not the case for some other CCA countries.

## **Ways and modalities for regional cooperation, including implementation schedule**

### Presentation

20. The FAO Locust Officer presented the Working Paper on the proposed programme to improve national and regional locust management in CCA. She said that this programme had been prepared on the basis of the conclusions and recommendations of the “Analytical Report on Locust Situations and Management in Caucasus and Central Asia (CCA)” and taking into account countries’ needs and expectations. She also underlined that the proposed programme was in line with the “preventive control” approach promoted by FAO.
21. The presentation was divided in three parts. The first part focused on technical ways to improve national and regional locust management, with a proposal built on six expected results and corresponding activities, as follows:
  - Result 1: Regional cooperation developed for better locust management
  - Result 2: National capacities strengthened
  - Result 3: Locust issues and disasters better anticipated and mitigated
  - Result 4: Improved response mechanisms to locust outbreaks
  - Result 5: Impact on human health and the environment mitigated and monitored
  - Result 6: Public information and awareness raising
22. The second part concerned timeframe, modalities and financial aspects for implementing this programme. The Locust Officer underlined the importance of developing an effective network, which could be done in the framework of the proposed five-year and multi-donor funded programme (tentative budget of USD 6,9 million).
23. The third part was dedicated to “Matters to agreed on”; actions to be taken by countries and FAO -and related commitments- were reviewed to that end.

### Discussion

24. Discussion took place first on technical aspects. Regarding **Result 1- “Regional cooperation developed for better locust management”**, all delegates underlined the necessity to enhance information sharing and exchange within the region, as the first practical step to develop effective regional cooperation. Electronic information exchange was considered more efficient than the conventional paper-based data sharing. Furthermore, countries expressed the need for centralized collection of all data.
25. With regard to the facilitation of cross-border activities, delegates agreed on the need to request the respective national governments to address this question in their policies. Delegate from Afghanistan raised the necessity of joint planning and executing anti-locust activities with neighboring countries, which ceased to exist after the collapse of the Soviet Union. Delegate from Kazakhstan specified that such cross-border activities (locust monitoring) could be regulated by bilateral agreements that her country had with

the Russian Federation, Uzbekistan and China (an agreement is also being signed with Kyrgyzstan). Regarding control operations, delegates agreed that each country should implement them on their own territory. For treatments close to the borders, delegate from Kazakhstan proposed to examine the possibility to create a reserve of pesticides and sprayers under the aegis of FAO, which could be quickly deployed in case of emergency.

26. For **Result 2- “National capacities strengthened”**, delegates fully supported the proposed Training-of-Trainers programme. Kazakhstan had already successfully experienced this formula during the development of the national locust Geographic Information System (GIS). Delegate from Afghanistan expressed the wish that training programmes would include bio-pesticides in addition to chemical ones. The representative of GTZ, Dr. Ralph Peveling, also suggested that internships in neighboring countries or other parts of the world be added in the programme and the delegate from Georgia supported this idea.
27. Lack of updated locust literature was deplored by all countries. Delegates emphasized the urgent need for educational material for all relevant targets, from locust specialists to farmers and children. The usefulness of atlas with illustrations and films was stressed. Despite the fact that several countries (for instance Uzbekistan, Kazakhstan and Tajikistan) issued brochures and booklets on locusts, relevant information in national languages remains scarce in most countries. It was also stressed that sometimes existing material was only in national languages but would need to be shared with other countries. It was therefore agreed to insist on the following aspects in the programme proposal: preparation of new material, review of the existing literature and translation of documentation, both into Russian and national languages. A possibility would be to have a committee of independent experts to review existing documentation and make selection of material to be translated and dispatched.
28. Support of post-graduate education was considered very important and timely by the delegates because in most countries many plant protection staff were close to retirement.
29. Concerning **Result 3- “Locust issues and disasters better anticipated and mitigated”**, the need for an operational and efficient common GIS was expressed by delegates from several countries. Technical improvements through the use of Global Positioning System (GPS) units compatible with computer software and through the use of satellite phone communications was raised by a Kazakh delegate.
30. On **Result 4- “Improved response mechanisms to locust outbreaks”**, delegates from several countries expressed concern regarding the possible build-up of locust resistance to pesticides. In the recent years, many areas of locust infestations had to be treated more than once, creating a potential for insecticide resistance. It was replied that this problem could be addressed by applying insecticides from different chemical groups and with different modes of action. As FAO advice on pesticide use was sought by several delegates, reference was made to the Pesticide Referee Group (PRG) reports, its contents and its use, and it was indicated that no insecticide resistance had been noted so far concerning locusts. The Secretary of the PRG, Dr Ralph Peveling (who attended the meeting as an observer from the *Deutsche Gesellschaft für Technische Zusammenarbeit - GTZ*), provided clarifications with regard to the PRG advisory role.

31. Regarding **Result 5- “Impact on human health and the environment mitigated and monitored”**, many delegates expressed concern with the fact that current locust management practices do not include a proper assessment of human health and environmental impacts. They also underlined that such impacts are often very hard to evaluate, especially if there are no adopted methods for these purposes. The delegate of Georgia invited his counterparts to liaise with the two national focal points for the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, from the ministries of agriculture and of health, to report any incident due to pesticides in their regular use.
32. There were no comments on **Result 6- “Public information and awareness raising”**.
33. The representative of GTZ said that the proposed five-year programme contained all necessary elements for good locust management practices and invited delegates to fully support it. He also recommended to the countries to take advantage of the huge knowledge accumulated by FAO in all regions of the world. Then, he said that there was a lot of expertise within the countries themselves. Some weak aspects of locust management in the region were mentioned, as follows: monitoring system and forecast analysis as well as human health and environment concerns, in particular post-treatment monitoring on non-target organisms. Countries were encouraged to address these aspects.
34. Following the discussion on technical aspects, ways and modalities to implement the proposed programme were addressed. Discussions concerned mainly the form of regional cooperation, with two possibilities envisaged by delegates: a network or a FAO Commission. The FAO Consultant, Locust Group, spoke of the most recent Locust Commission created by FAO -the Commission for Controlling the Desert Locust in the Western Region (CLCPRO)- providing information on its role and on the obligations of the Member Countries in terms of activities and financial contributions. Many delegates expressed their wish to establish a FAO Commission for better coordination of activities at regional level. However, delegates estimated that it would be more realistic to start with a network to be established during the proposed five-year programme, for two main reasons: the first one because they were not empowered to make decision involving financial commitments; the second one because of time needed to launch effective cooperation. Furthermore, delegates agreed that it would be easier to obtain the support of their governments for creating a Commission after regional cooperation would have effectively started and concrete results achieved. A comprehensive study should also be conducted in the framework of the five-year programme, with review of financial and non-financial implications. The importance to inform and liaise with politicians to mobilize political will was underlined.
35. The delegates of the present countries expressed their full support to the proposed five-year programme, including the Russian Federation who was participating as an observer in this Regional Consultation.
36. Delegates were informed by the FAO Secretariat that next step was for FAO to seek funding for the five-year programme. Besides donors, it was said that some countries of the region could consider financially supporting this programme and they were encouraged to do so.

## **SESSION 3: GATHERING AND SHARING INFORMATION**

### **Website “Locust Watch in Caucasus and Central Asia”**

37. Ms Marion Chiris, FAO Consultant, Locust Group, presented the recently created FAO website “Locust Watch in Caucasus and Central Asia”. She informed that this website had been prepared with a triple objective: develop a specialized technical tool on locust pests in CCA; increase visibility of the regional approach; and contribute to develop this regional approach as facilitator for information exchange. She said that targets were primarily the decision-makers and locust specialists of the concerned countries but also any other interested public including donors. Then, she presented the seven main pages of the website, on the following topics: locusts, regional approach, survey, control, documents, photos, and information. Particular focus was put on the sub-page “Locust situations, now!” where updated information will be regularly posted based on national monthly bulletins. Special attention was also given to the part on regional approach which would contain updated information on the implementation of related projects.
38. During the discussion and upon request of the FAO Consultant, countries agreed to insert a page on national contact points, possibly the national consultants responsible for the preparation of the monthly bulletins. Delegates insisted on the importance of having a bilingual online glossary (already planned in the website). They also suggested that the website contain pages on cross-border issues, national legal framework for locust management, registered pesticides and human health and environmental aspects. The delegate of Kyrgyzstan, supported by other delegates, also suggested some distance-learning facilities. The delegate of Kazakhstan welcomed the website as a useful concrete step towards information exchange, which could be presented to decision-makers.

### **Monthly national locust bulletins**

39. In the framework of the current FAO regional project TCP/INT/3202 (D), countries should issue monthly bulletins on locust situation during their respective locust seasons. To facilitate this activity, consultants are being recruited at national level. In order to agree on standardized presentation of the information, the FAO Locust Officer proposed a template for the Locust Monthly Bulletin (Annex IV).
40. During discussions, the question of timeliness was raised by the delegate of the Russian Federation. He explained that due to the size of the country and the necessity to obtain internal authorizations before disseminating data, it was not possible to deliver quickly such kind of information. He added that similar situations might arise in other CCA countries. The delegate from Kazakhstan supported his views but all other delegates replied that it was not relevant for them. They argued that their governments had signed the current FAO project and therefore agreed with its activities. In addition, the governments had proposed candidates as national consultants, who were consequently authorized to deliver information on locust situations and management. The delegate from Armenia underlined that durations and timings of the locust seasons varied according to the countries. This would have an impact on the national bulletin issuance schedule.

41. At the end of the discussion, the template was approved and its use agreed by all delegates.

### **Standard survey and spray monitoring forms**

42. The draft of the Standard Survey Form was presented by the FAO Locust Officer. In the discussion that followed, the delegate from Tajikistan said that this form had been introduced in the country in 2003. He added that it was a very easy-to-use and detailed form. The delegate from Armenia expressed the concern that some of the activities proposed in the form, namely, the egg-pod survey, were not conducted in his country due to lack of funds and qualified personnel. Because of that, such activities would not be reflected in the form filled out in Armenia. The delegates from Afghanistan and Armenia also said that their country were not equipped with meteorological tools to collect the weather data requested in the form. The FAO Locust Officer replied that the form proposed an exhaustive list of data that should ideally be reported in the field but that it had to be filled in according to the currently available national technical capacities and practices. The FAO Consultant, Locust Expert, also explained that such form would allow to have a standardized approach and underlined the necessity to make it available both in Russian and national languages.
43. The delegate from the Russian Federation inquired about the methods of summarizing the information collected through the proposed form adding that processing a huge amount of forms in FAO Headquarters would be unrealistic. The FAO Locust Officer explained that the proposed form was a tool for the national services dealing with locust monitoring, while FAO should receive only the summarized information in the form of national bulletins. Synthetic information would then be posted on the Website “Locust Watch in Caucasus and Central Asia”.
44. The observer from Kazakhstan, Prof. V.E. Kambulin, proposed to include illustrations of the locust species and their life stages on the back of the form (which was blank anyway), arguing that a lot of non-professional would use it, especially during outbreaks. His proposal was supported by the other delegates. A part of the discussion also concerned editorial changes and rearrangement of several entries.
45. After the discussion, the form with proposed changes was adopted by all delegates, who agreed to use it in their respective countries (Annex V).
46. The draft of the Standard Spray Monitoring Form was presented by the FAO Locust Officer. In the discussion that followed, the delegate from Kazakhstan proposed to include information on the dose rate and vegetation density, the latter being important for insecticide with stomach action. She also proposed to include information on areas infested with densities exceeding Economic Injury Threshold. The delegate from Afghanistan proposed to add the name of the applicator).
47. After the discussion, the form with proposed modifications was adopted by all delegates, who agreed to use it in their respective countries (Annex VI). It was said that the most important/mandatory fields in the form could be marked with an asterisk.

## **SESSION 4: NEXT ACTIVITIES WITHIN FAO PROJECT TCP/INT/3202 (D)**

### **Workshop on Locust Control: objectives and content**

48. The objectives and contents of the Workshop on Locust Control, planned in the framework of the current FAO regional project TCP/INT/3202 (D), were discussed following introduction made by the FAO Locust Officer. Countries agreed to address the following points during the workshop, which should be held during the autumn 2010: lessons learnt from last campaigns (2009 and 2010); preparation of the next campaign (2011); update on the implementation of the current FAO project, in particular concerning issuance of monthly bulletins and emergency assistance provided in 2010; and latest developments on environmentally less hazardous pesticides and control techniques. Upon proposal of Kazakhstan, delegates supported the idea to hold this five-day workshop in Kyrgyzstan. The delegates also expressed the wish that the Russian Federation be invited to participate in this regional workshop -as an observer since it is not yet part of the current TCP- in order to contribute to the regional exchange of experience to the mutual benefit of all countries.

### **Preparation of the 2010 locust campaign**

49. Upon invitation of the FAO Secretariat, each country provided information on locust forecast, funds' availability and campaign management for 2010.

- Afghanistan: the main problems are due to DMA. Egg-pod survey is not conducted in all infested areas because of security concerns. Pesticide procurement is done 0.5-1 year before the campaign, which starts after the 21<sup>st</sup> of March (New Year Day according to the Afghan calendar). In 2010, it is expected to treat about 140 000 ha.

- Armenia: in 2010, it is expected that 30-35 000 ha will be infested by locusts of which 5 000-7 000 ha above the Economic Injury Threshold (EIT).

- Azerbaijan: because of warm autumn, locust mortality should be lower than usual, and infested areas in 2010 are expected to be somewhat higher than in 2009 (130 750 ha). Adjustment of the forecast will be made after the early spring 2010 egg-pod survey.

- Georgia: locust management is under the responsibility of a newly-created service (2006), which lacks qualified staff. The 2009 situation was very serious and some crop areas (wheat) were not treated because of insufficient funds and technical means. In 2010, some 8 000 ha are expected to be treated with ultra-light aircraft. The country created a pesticide reserve to that end. However, there are no sufficient funds and qualified personnel to ensure proper monitoring of vast infested areas, which subsequently hamper taking decision on appropriate control. On this basis, Georgia requested FAO assistance to monitor locusts, particularly in the eastern part of the country.

- Kazakhstan: up to one billion Kazakh Tenge (KZT), equivalent to USD 6.7 million, are available for the 2010 monitoring of especially dangerous pests, diseases and weeds. Hopper survey is planned on 10 million ha and related treatments on 1 887 000 ha (the exact figures will be corrected in spring 2010). It is expected that DMA will continue in 2010 the decline that started in 2009 due of excessively wet weather conditions in South Kazakhstan. In 2010, CIT is expected to infest areas slightly at a lower scale than in 2009.

Conversely, the Asian Migratory Locust (LMI) will continue its upsurge in some permanent breeding areas and will infest larger areas than in 2009. Non-swarming grasshoppers are becoming a serious problem. They are expected to be treated on 860 000 ha in 2010, mostly hayfields and pastures; they also threaten the adjacent crops which are planted on significantly higher areas than several years ago.

- Kyrgyzstan: in 2009, there was a small (16%) decline in DMA-infested areas compared to 2008. Egg-pod survey is underway now. It is planned that about 100 000 ha will be treated in 2010.

- Tajikistan: DMA situation in the past two years was equally serious. For 2010, an equivalent of about one million USD is allocated for locust control. The area to be surveyed is of 350 000 ha; treatments are planned on 150 000 ha, which is not sufficient. The newly-created State Republican Unitary Enterprise “Locust Control” will be responsible for implementing locust management.

- Uzbekistan: locust upsurge -primarily DMA- continues for the fifth year in a row. Area to be treated is expected to be around 630 000 ha in 2010. In addition, non-swarming grasshoppers are expected to infest about 200 000 ha; some of that area may be treated which would bring the total area to be treated to more than 800 000 ha. The sustained specialized locust control expeditions are responsible for locust management in six oblasts. The republic is well prepared in terms of spraying equipment which includes 180 tractors, 670 knapsack motorized sprayers, five Deltaplanes, ten Antonov-2 aircraft, and 35 AU-8115 Ulvamast (ULV) vehicle-mounted sprayers. In 2010, the country is planning to treat 70% of locust infestations with long-acting pesticides like Insect Growth Regulators (IGRs). LMI situation in the Aral Sea region remains a problem, with CIT-infested areas also increasing. Uzbekistan requested FAO assistance in monitoring locusts in the Aral Sea area in 2010 because of insufficient technical means and difficult accessibility of the breeding areas.

- Russian Federation: autumn survey started only 10 days ago, so it is premature to give definite figures. It is expected that the main CIT problem area will be between Bashkortostan and Orenburg oblast (50 000 ha). In the Southern part, CIT level will remain approximately the same as in 2009 (300 000 ha). In the Caspian Sea region, LMI is expected to continue its upsurge. To sum up, the area to be treated in 2010 is expected to be similar to 2009 (close to 600 000 ha). The pesticides will be procured on 50 million Roubles (RUB), equivalent to about USD 1.8 million. In total, the monitoring/control service (all pests) has a federal budget of 1 750 million RUB (equivalent to USD 60 million) for 2010.

50. Concerning the requests for technical assistance made by Georgia and Uzbekistan to better monitor locust populations during the 2010 locust campaign, the FAO Locust Officer said that limited specific assistance was planned in the framework of the FAO regional project TCP/INT/3202 (D) and that further liaison would be ensured with the two countries to address their requests.
51. Regarding information exchange during locust campaigns, the FAO Locust Officer requested the national consultants for “Information Collection, Standardization and Sharing” under project TCP/INT/3202 (D) to prepare and transmit a summary on the 2009 locust campaign, once the national end-of-campaign report would be issued. Other

practical aspects were addressed such as the recruitment process (done for the major part of consultants, under process for some others) and channels of communication.

#### **ANY OTHER BUSINESS**

52. The delegate of Uzbekistan showed a 30-minutes video, entitled “*Locusts – the important agricultural pests*” (scientific consultant: Prof. F.A. Gapparov). The film documented biology, control operations and other aspects of locust management in Uzbekistan during the recent campaigns as well as a meeting with a Turkmen delegation along their common border. The other delegates appreciated very much the video and requested copies for sharing and training at national level (such copies were prepared and dispatched to all participants).
53. In addition, the Russian-language book “*Acridids of Kazakhstan, Central Asia and adjacent territories*” was graciously distributed to all participants by three of the authors, Prof. F.A. Gapparov, Prof. V.E. Kambulin and Prof. A.V. Latchinisky. This 300-page book is the most comprehensive and up-to-date source of information on locust biology, ecology and management in CCA. It was highly appreciated by all the delegates. To make it more available, it was planned to place the book on the website “Locust Watch in Caucasus and Central Asia”.

#### **ADOPTION OF THE REPORT**

54. This report with agreed amendments was adopted unanimously.

#### **CLOSURE OF THE MEETING**

55. In the closing remarks, the FAO Locust Officer thanked all delegates for their contributions and active participation during the Regional Consultation and noted that all the agenda items had been addressed comprehensively. She added that due note had been taken of the latest developments of the national locust situations and of the proposals made to improve the five-year programme. She summarized the main points underlined by countries and said that she was very pleased with the concrete outputs reached during the meeting, which were steps towards effective regional cooperation. Then the Locust Officer expressed her thanks to her FAO colleagues who contributed in the development of the regional approach and in the success of the Regional Consultation. She also thanked the national consultant for meeting arrangements and the interpreters. The Locust Officer said that delegates would be the most efficient ambassadors to promote this regional locust approach and ensured them that FAO would contribute to mobilize political will as well as donors. She wished all participants a safe journey home.
56. The Chairperson, Ms G. Yusupova, congratulated all participants for the fruitful meeting and warmly welcomed the promoted regional cooperation in Caucasus and Central Asia. She thanked all participants for their good contributions and added her wishes for a safe journey home. She formally declared the Regional Consultation closed.

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## Annex I - List of participants

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**Annex II - Approved agenda**

<b>Regional Consultation on Locust Management in Caucasus and Central Asia (CCA)</b>
<b>27- 30 October 2009, Almaty, Kazakhstan</b>
<b>AGENDA</b>

**Opening**

1. Opening address
2. Election of Chairman, Vice-Chairman & Drafting Committee
3. Adoption of the agenda

**Session 1: National locust situations in 2008/2009**

4. Presentation by country

**Session 2: Towards regional cooperation**

5. Presentation of the analytical report on locust situations and management and recommendations
6. Ways and modalities for regional cooperation, including implementation schedule

**Session 3: Gathering and sharing information**

7. Standard survey and control forms
8. Monthly national locust bulletins
9. Website “Locust Watch in Caucasus and Central Asia”

**Session 4: Next activities within project TCP/INT/3202 (D)**

10. Workshop on locust control: objectives & content
11. Preparation of the 2010 locust campaign
12. Any other business

**Closing**

13. Adoption and signature of the report
14. Feedback by the participants
15. Closure address

## Annex III - National locust situations in 2009

### AFGHANISTAN

There are three economically important locust species in Afghanistan. The Desert Locust *Schistocerca gregaria* (Forskål, 1775) can invade five southern and southeastern provinces. The Moroccan Locust *Dociostaurus maroccanus* (Thunberg, 1815), which is the main agricultural pest, has permanent breeding areas in the 11 northern and central provinces. The Italian locust *Calliptamus italicus* (Linnaeus, 1758) has limited distribution and economic importance. In 2008, locusts were controlled on 236 072 ha, mostly by mechanical (digging trenches) and chemical (Insect Growth Regulators and synthetic pyrethroids) methods. In 2009, out of about 200 000 ha surveyed against locusts, 170 000 ha were infested. However, the egg-pod survey was not implemented in all locust breeding areas because of difficult accessibility and security concerns. Control operations were conducted on 140 265 ha, with largest treated areas in the provinces of Samangan, Balkh and Baghlan (over or about 20 000 ha each). In 2010, it is planned to control locusts on about 140 000 ha.

### ARMENIA

Locust management is funded by the centralized national budget. Special forms, which are approved by the Minister of Agriculture, are used for locust monitoring. The Italian Locust only was found in Armenia in the recent years. In 2008, locust monitoring was implemented on 33 500 ha, and control operations were carried out on 5 480 ha, where locust density exceeded the Economic Injury Threshold. In 2009, the monitored and infested areas were of 27 300 ha, and treatments were applied to 4 900 ha. Treatments were done with synthetic pyrethroids. There are no specialized anti-locust services in Armenia. Control operations are carried out by private companies (selected through public tender), under the supervision of the Ministry of Agriculture.

### AZERBAIJAN

In 2009, 280 000 ha were surveyed, 130 750 ha infested, and 50 100 ha treated, mostly against the Moroccan Locust. Vegetation in the locust-infested areas was dominated by sage brushes (*Artemisia spp.*) and spring ephemerals. Locust hatching started in late March/early April with peak of hatching in mid-April. Chemical treatments were implemented using the following pesticides (synthetic pyrethroids): Kingdoks 2.5% (active ingredient –a.i.- beta-cyfluthrin), Cirax 10% (a.i. cypermethrin) and Kortak 25% (a.i. alpha-cypermethrin). Treatment efficacy was above 90%. During the treatments, the following technical support was used: automobiles, tractor-, knapsack- and handheld sprayers. Egg-laying started in second decade of June. Weather conditions during summer were warm with moderate precipitation.

### GEORGIA

During outbreaks, locusts damage many cultivated crops, such as grains, legumes, sunflowers, potatoes, vineyards, vegetables, pastures and grasslands, etc. Locusts cause devastating damage to well-being of farmers and cattle breeders sector, jeopardizing the national economics and food security. The main threats are the Italian Locust, the Moroccan Locust and, periodically, also the Asian Migratory Locust *Locusta migratoria migratoria* (Linnaeus, 1758). Locust monitoring and control is carried out by the local staff, together with specialists of the National Service of Food Safety, Veterinary and Plant Protection of the Ministry of Agriculture. In 2009, treatments had a five-week duration. They were done on 5 209 ha by

Ultra-Low Volume (ULV) ground sprayers “TIFA 100E PLUS” and Low Volume (LV) ground sprayers “SCOUT”. Aerial treatments was performed by ultra-light aircraft “BEKAS” (using ULV atomizers) on 6 618 ha. In total 11 827 ha were treated. Biological effectiveness was from 70 to 80%. There are 15 pesticides from different chemical groups registered for locust control: Synthetic pyrethroids, Organophosphates, Chloro-nicotinyls, Phenyl-pyrazoles, and Insect Growth Regulators. In 2009, the national budget allocated was 827 000 Georgian Lari, equivalent to about USD 490 000, in the framework of the National Programme “Plant Protection” for locust control.

## KAZAKHSTAN

The three economically important locust pests in Kazakhstan are the Italian, Asian Migratory and the Moroccan Locust. A number of non-swarmling grasshoppers and katydids are also serious rangeland and agricultural pests. The information regarding surveyed, infested and treated areas in 2009 is presented in the below table. Locust monitoring and control is funded from the national budget. In 2009, 109 688 l of insecticides were purchased through tenders for locust control (650 million Kazakh Tenge equivalent to about USD 4 325 000). The bulk of the treatments were done with the following three insecticides: Hercules 48% Wettable Concentrate (active ingredient -a.i.- diflubenzuron), Imidor 20% Water-dispersible granules (a.i. Imidacloprid) and Adonis 4% Emulsifiable Concentrate (a.i. Fipronil). Most treatments were applied using Antonov-2 aircraft (563 900 ha), ultra-light aircraft (662 000 ha) and aerosol generators (492 400 ha). The Ultra-Low Volume technology was used on 226 600 ha (in 2008: 191 800 ha).

Acridid species	Areas concerned in 2009 (ha)			Forecast for 2010 control (ha)
	Surveyed	Infested	Treated	
<b>Locusts</b>	10 324 100	2 983 400	1 945 800	1 880 710
Asian Migratory Locust	2 909 200	1 147 400	886 600	654 560
Italian Locust	6 653 600	1 722 300*	996 700	1 146 070
Moroccan Locust	761 300	113 700	62 500	80 080
<b>Grasshoppers</b>	2 779 800	1 791 400	167 700	895 480
<b>Total</b>	13 103 900	4 774 800	2 491 200	2 776 190

\*For the Italian Locust, the figures concern the hopper population, which infested an area of 1 722 300 ha, of which 997 400 ha were above the Economic Injury Threshold.

## KYRGYZSTAN

The most economically important acridid pests are the Moroccan Locust (Jalal-Abad, Batken, Osh oblasts) and the Italian locust (Naryn, Tchu, Talas oblasts) as well as several grasshopper species. Locust peak was in 2008: out of 232 600 ha surveyed, 157 000 ha were treated, mostly against the Moroccan Locust in the southern oblasts. In 2009, some decline in infested areas was observed: from 194 300 ha surveyed, 126 900 ha were treated, including 2 800 ha against grasshoppers. Infested and treated areas in 2009 were below the forecasted 162 400 ha, because of cool and wet spring weather which delayed and spread out locust hatching and nymphal development; abundant native grassland vegetation provided plentiful food for locust nymphs in hatching areas and decreased the threat of their fast migration into crops, as it used to happen in the previous years. While in 2008 some treatments were done by ultra-light aircraft (motorized deltaplanes), their use in mountainous areas was banned by the Department of Civil Aviation in 2009. Treatments were done with tractor and vehicle-mounted Ultra-Low Volume (ULV) sprayers, as well as with Antonov-2 aircraft (more than 60% of areas treated being in mountainous areas with difficult access). The following insecticides were used: Mergen 80% Water-Dispersible Granules (active ingredient - a.i. fipronil), Piket 10% Emulsifiable Concentrate –EC- (a.i. alpha-cypermethrin), Karate 5% EC

(a.i. lambda-cyhalothrin) and Super-Alpha 20% EC (a.i. esfenvalerate). More 4x4 vehicles are needed for surveys in mountainous areas. It is also necessary to purchase more ULV sprayers (hand-held, knapsack and vehicle-mounted) and aerosol generators. There is a shortage of survey equipment, personal protection gear, office equipment, and mobile phones. There are no Global Positioning System units, internet capacities and Geographical Information System software. Plant protection service is lacking experienced staff, and the currently employed specialists did not receive updated training for a long time. In order to improve locust population management it is necessary to create a well-equipped and staffed center to monitor locusts in their permanent breeding areas. In 2010, it is planned to conduct anti-locust chemical treatments on an area of about 100 000 ha.

## **TAJIKISTAN**

Two locust species are economically important, the Moroccan Locust and the Italian Locust, as well as grasshoppers. Moroccan Locust, which damages mostly rangeland but threatens also all crops, has permanent breeding areas in Khatlon and Sogdia oblasts and in Districts of Republican Subordination. Italian Locust has permanent breeding areas in Khatlon oblast. In 2009, the locust situation (primarily Moroccan Locust) was very serious. It was aggravated by swarm flights from Uzbekistan, Afghanistan and Kyrgyzstan. The surveyed area was 233 479 ha, out of which 104 334 ha were infested. Chemical treatments were carried out on 93 268 ha. Treatments were conducted by the newly-established Republican State Unitary Enterprise “Locust control” which has 91 permanent staff. The planned area for treatments in 2010 is about 150 000 ha which might not be sufficient to control all locust infestations.

## **UZBEKISTAN**

In 2009, the weather conditions were wet. Because of high humidity and low temperature, hatching of the Moroccan Locust was spread out from March 20 till April 15. The average duration of the Moroccan Locust life cycle in 2009 was of 95 days compared to 72 days in 2008. The total controlled area (all locust and grasshopper species together) was 621 000 ha, including 540 000 ha against the Moroccan Locust, 21 000 ha against the Asian Migratory Locust, 35 000 ha against the Italian Locust, and 25 000 ha against grasshoppers and katydids. The treated area has increased annually by 20-25% during the last five years.

## **RUSSIAN FEDERATION**

About 60 species of acridids are known to be pests in the Russian Federation. Among locusts, the most damaging are the Asian Migratory Locust and the Italian Locust. Among grasshoppers, the most frequent pests of hayfields, rangelands and cultivated crops are: *Aeropus sibiricus*, *Stauroderus scalaris*, *Arcyptera microptera* and others. Specialists from the Federal State Enterprise “Rosselkhozcentre” (“Russian Agro Centre”) conducted the early-spring egg-pod survey in 2009. According to results, about 822 000 ha were expected to be infested by locusts and 2 270 000 ha by grasshoppers. Average density of locust hoppers was 42/m<sup>2</sup> in mid-June with maximum up to 3 000/m<sup>2</sup> (on 37 200 ha in Volgograd oblast). Average grasshopper nymphal density was about 8/m<sup>2</sup> with maximum up to 67/m<sup>2</sup> (on 3 100 ha in Ingushetiya Republic). In Astrakhan and Rostov oblasts, in Krasnodar region and in the Republics of Kalmykia and Chechnya, emergency advisory was announced. The area of treatments in the South Federal District reached 134 000 ha. It was covered by federal budget (11 million Roubles, equivalent to about USD 383 000). In total, over 11 481 000 ha were surveyed against locusts, grasshoppers and katydids in the Russian Federation in 2009 and chemical treatments were implemented on 461 000 ha.

## Annex IV - Approved Template for Monthly National Locust Bulletin

### COUNTRY

### BODY (MINISTRY/DEPARTMENT/SERVICE) IN CHARGE OF LOCUST MANAGEMENT

<Create a header with name of the country + Name & coordinates of the body in charge of locust management>



### MONTHLY NATIONAL LOCUST BULLETIN No ...

**Situation level (by each species separately: CIT, DMA, LMI, other):** Calm – Caution – Threat – Danger

Insert a colour box to indicate the situation level as follows for **Locust warning levels**. A colour-coded scheme indicates the seriousness of the current locust situation: green for calm, yellow for caution, orange for threat and red for danger. This scheme should be applied to the monthly bulletin's header. The levels indicate the perceived risk or threat of current locust infestations to crops and appropriate actions are suggested for each level.

Insert a summary of 10 lines maximum presenting the general locust, weather, vegetation/crops situation and information on control operations during the past month, as well as the likely developments up to 1.5 month.

**1. Weather/Ecological/Vegetation/Crops Conditions during** [indicate name of the month considered + year]

**2. Area Treated (by each species separately: CIT, DMA, LMI, other)**

Provide information on treated areas: location, number of hectares treated & dates/period of control operations.

**3. Locust Situation and Forecast**

**3.1. Detailed situation (by each species separately: CIT, DMA, LMI, other)**

- Chronologic synthesis of the situation observed during the month, ideally by decade.
- Present this synthesis by region/geographical entity.
- Indicate: stage of development (and instar for hoppers) and behaviour (marching/eating/fledging for hoppers, roosting/flying/eating), density, phase, locations (with GPS coordinates) where observations were made or infestations reported. For all these data, reference is made to the Standard Survey Form.
- Nature of control operations using data of the Standard Control Form.
- Details on cross-border operations (joint surveys and control).

**3.2. Forecast (by each species separately: CIT, DMA, LMI, other)**

Based on knowledge of the locust bio-ecology, experience and past similar situations, present the expected developments for the next month and a half (or for the next year if it is the last bulletin of the locust season/campaign).

**3.3. Map(s) (by each species separately: CIT, DMA, LMI, other)**

Insert a map presenting current situation and expected developments during the considered forecast period.

**4. Announcements**

Other information concerning:

- Recent and forthcoming meetings & workshops (national & regional)
- Recent and forthcoming training sessions (national & regional)
- Other

## Annex V - Approved Locust Survey Form

## ITALIAN, MOROCCAN, MIGRATORY &amp; OTHER LOCUST SURVEY FORM

&lt;COUNTRY&gt;      &lt;Province&gt;      &lt;District&gt;      Observer's name: ...

1	SURVEY STOP	1	2	3	4	5
1-1	date (day/month/year) & time					
1-2	name of the village or site					
1-3	latitude (N)					
1-4	longitude (E)					
1-5	GPS use? (Y or N)	Y N	Y N	Y N	Y N	Y N
2	<b>ECOLOGY</b>					
2-1	surface of surveyed area (ha)					
2-2	habitat CIT (steppe, fallow, crops) habitat DMA (plain, hill, crops) habitat LMI (short dry reeds, tall wet reeds, other) habitat other species					
2-3	vegetation (dry, greening, green, drying)					
2-4	vegetation cover (Low Medium Dense)	L M D	L M D	L M D	L M D	L M D
2-5	weather: air temperature (°C)					
2-6	weather: wind (m/s)					
3	<b>LOCUSTS</b>					
3-1	present or absent	P A	P A	P A	P A	P A
3-2	area infested (ha)					
4	<b>EGGS</b>					
4-1	egg-bed (surface in m <sup>2</sup> )					
4-2	egg-pods (density/m <sup>2</sup> )					
4-3	eggs (average number/egg-pod)					
4-4	eggs (% viable)					
4-5	natural enemies present (which?)					
5	<b>HOPPERS</b>					
5-1	hatching					
5-2	hopper stages (Young Medium Large)	Y M L	Y M L	Y M L	Y M L	Y M L
5-3	appearance (solitary, <i>transiens</i> , gregarious)	S T G	S T G	S T G	S T G	S T G
5-4	behaviour (isolated, scattered, groups)	I S G	I S G	I S G	I S G	I S G
5-5	hopper density (/m <sup>2</sup> )					
6	<b>BANDS</b>					
6-1	band stage (Small Medium Large)	S M L	S M L	S M L	S M L	S M L
6-2	band density (/m <sup>2</sup> or Low Medium High)					
6-3	band sizes (m <sup>2</sup> or ha)					
6-4	number of bands					
6-5	Marching, Eating, Roosting	M E R	M E R	M E R	M E R	M E R
7	<b>ADULTS</b>					
7-1	fledging (% beginning & mass)					
7-2	maturity (immature, mature)	I M	I M	I M	I M	I M
7-3	appearance (solitary, <i>transiens</i> , gregarious)	S T G	S T G	S T G	S T G	S T G
7-4	behaviour (isolated, scattered, groups)	I S G	I S G	I S G	I S G	I S G
7-5	adult density (/transect or /ha)					
7-6	breeding (copulating, laying)	C L	C L	C L	C L	C L
7-8	flying	Y N	Y N	Y N	Y N	Y N
8	<b>SWARMS</b>					
8-1	swarm density (/m <sup>2</sup> or Low Medium High)					
8-2	swarm size (km <sup>2</sup> or ha)					
8-3	number of swarms					
8-4	breeding (copulating, laying)	C L	C L	C L	C L	C L
8-5	flying (direction, time passing)					
8-6	flying height (Low Medium High)	L M H	L M H	L M H	L M H	L M H
9	<b>COMMENTS</b>					

## Annex VI - Approved Locust Spray Monitoring Form

(indicate appropriate information as required)

1	CONTROL LOCATION	1	2	3	4	5	6
1-1	date						
1-2	name						
1-3	latitude (N)						
1-4	longitude (E)						
1-5	area infested (ha)						
1-6	area treated (ha)						
2	<b>VEGETATION DATA</b>						
2-1	vegetation type (Natural, Crop)	N C	N C	N C	N C	N C	N C
2-2	height (m)						
2-3	vegetation cover (%)						
2-4	crop names and damage (%)						
3	<b>INSECTICIDE DATA</b>						
3-1	trade name						
3-2	concentration (g a.i./l or %)						
3-3	formulation (EC, ULV, other)	E U O	E U O	E U O	E U O	E U O	E U O
3-4	dose rate (l/ha)						
3-5	rate of working solution (l/ha)						
3-6	expiry date						
3-7	is insecticide mixed with water or solvent?	Y N	Y N	Y N	Y N	Y N	Y N
3-8	if yes, what solvent and mixing ratio						
4	<b>WEATHER CONDITIONS</b>						
	start & end of control operations	start	end	start	end	start	end
4-1	time						
4-2	temperature (°C)						
4-3	relative humidity (%)						
4-4	wind speed (m/s)						
4-5	wind direction (degrees from N)						
4-6	spray direction (degrees from N)						
5	<b>TARGET LOCUST</b>						
5-1	species: CIT, DMA, LMI, Other	C D L O	C D L O	C D L O	C D L O	C D L O	C D L O
5-2	Hoppers (stages: S M L) or Adults	S M L A	S M L A	S M L A	S M L A	S M L A	S M L A
5-3	density (per m <sup>2</sup> or ha)						
5-4	hopper bands, swarms or scattered	HB Sw Sc	HB Sw Sc	HB Sw Sc	HB Sw Sc	HB Sw Sc	HB Sw Sc
6	<b>SPRAY APPLICATION</b>						
6-1	sprayer platform (Aerial, Ground, Handheld)	A G H	A G H	A G H	A G H	A G H	A G H
	Aerial: Plane, Helicopter, Deltaplane	P H D	P H D	P H D	P H D	P H D	P H D
	Ground: Tractor, Vehicle, Aerosol G	T V AG	T V AG	T V AG	T V AG	T V AG	T V AG
	Hand: Knapsack, Hand-held	KS HH	KS HH	KS HH	KS HH	KS HH	KS HH
6-2	sprayer operator (Pilot, Driver, Other)	P D O	P D O	P D O	P D O	P D O	P D O
6-3	name of operator						
6-4	sprayer manufacturer						
6-5	sprayer model						
6-6	date of last calibration						
6-7	atomizer height above ground (m)						
6-8	treated swath width (m)						
6-9	track spacing (m)						
6-10	BARRIERS ONLY: width and spacing (m)						
6-11	forward speed (km/h)						
6-12	AERIAL: DGPS used (Y, N)	Y N	Y N	Y N	Y N	Y N	Y N
6-13	ground marking (GPS, Flag, Vehicle, No)	G F V N	G F V N	G F V N	G F V N	G F V N	G F V N
7	<b>CONTROL EFFICACY</b>						
7-1	locust mortality (% dead)						
7-2	time after treatment (hours)						
7-3	method of mortality estimation						
8	<b>SAFETY AND ENVIRONMENT</b>						
8-1	protective clothing: what did the operator wear?	G = goggles M = mask L = gloves O = overalls B = boots					
		G M L O B	G M L O B	G M L O B	G M L O B	G M L O B	G M L O B
8-2	who was informed of spraying? (Farmer, Villager, Official, Beekeeper)	F V	F V	F V	F V	F V	F V
		O B	O B	O B	O B	O B	O B
8-3	effect on non-target organisms	Y N	Y N	Y N	Y N	Y N	Y N
8-4	if yes, what						
8-5	details of anyone who felt unwell or if other problems were encountered:						